RIBOSOME TRANSFER FROM SCHWANN CELLS TO AXONS IN THE PERIPHERAL NERVOUS SYSTEM

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In the nervous system, the studies of signal processing and plastic phenomena have focused on synaptic mechanisms. In contrast, axons are considered a rather static array of lines of communication. In contrast to this view, we have proposed a model called 'the autonomous axon", the main feature of which is that the axonal phenotype is dynamic, i.e., subject to local modifications in response to local challenges, without the immediate participation of the neuronal cell body. In this model, the Schwann cell is a major regulator of the axon. When the set of local regulators changes, so does the axonal phenotype. The axon is currently considered unable to synthesize proteins and to be fully dependent on its perikaryon. Recently, growing axons have been shown to contain ribosomes and to synthesize proteins. In adult mice, we found that peripheral axons contain ribosomes, that they are transferred from the associated Schwann cell, and that this transcellular transfer is up-regulated by nerve section and during axonal regeneration. Therefore, the axon, which is anatomically a part of the nerve cell, is supported in such a basic function as protein synthesis by an associated cell. Preliminary evidence supports that messenger RNAs are also transferred to the axon along with ribosomes. The phenotype of a cell is the organization of its constituent proteins, which determines its functional capabilities. Thus the axon appears as a sort of joint venture of the nerve cell and the glial cell encompassing the axon as its phenotype is specified by the genome of two independent cells. This role of the glia endows our understanding of the nervous system with an unsuspected dimension.